

# Researchers finds hidden sensory system in the skin

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Researchers report that the human body has an entirely unique and separate sensory system aside from the nerves that give most of us the ability to touch and feel. Surprisingly, this sensory network is located throughout our blood vessels and sweat glands, and is for most people, largely imperceptible. This discovery may shed light on the causes of unexplained chronic pain conditions such as fibromyalgia.

The human sensory experience is far more complex and nuanced than previously thought, according to a groundbreaking new study published in the December 15 issue of the journal *Pain*. In the article, researchers at Albany Medical College, the University of Liverpool and Cambridge University report that the human body has an entirely unique and separate sensory system aside from the nerves that give most of us the ability to touch and feel. Surprisingly, this sensory network is located throughout our blood vessels and sweat glands, and is for most people, largely imperceptible.

"It's almost like hearing the subtle sound of a single instrument in the midst of a symphony," said senior author Frank Rice, PhD, a Neuroscience Professor at Albany Medical College (AMC), who is a leading authority on the nerve supply to the skin. "It is only when we shift focus away from the [nerve endings](#) associated with normal skin sensation that we can appreciate the sensation hidden in the background."

The research team discovered this hidden sensory system by studying

two unique patients who were diagnosed with a previously unknown abnormality by lead author David Bowsher, M.D., Honorary Senior Research Fellow at the University of Liverpool's Pain Research Institute. These patients had an extremely rare condition called congenital insensitivity to pain, meaning that they were born with very little ability to feel pain. Other rare individuals with this condition have excessively dry skin, often mutilate themselves accidentally and usually have severe mental handicaps. "Although they had a few accidents over their lifetimes, what made these two patients unique was that they led normal lives. Excessive sweating brought them to the clinic, where we discovered their severe lack of pain sensation," said Dr. Bowsher. "Curiously, our conventional tests with sensitive instruments revealed that all their skin sensation was severely impaired, including their response to different temperatures and mechanical contact. But, for all intents and purposes, they had adequate sensation for daily living and could tell what is warm and cold, what is touching them, and what is rough and smooth."

The mystery deepened when Dr. Bowsher sent skin biopsies across the ocean to Dr. Rice's laboratory, which focuses on multi-molecular microscopic analyses of nerve endings in the skin, especially in relation to chronic pain conditions such as those caused by nerve injuries, diabetes, and shingles. These unique analyses were pioneered by Dr. Rice at Albany Medical College (AMC) along with collaborators at the Karolinska Institute in Stockholm, Sweden. "Under normal conditions, the skin contains many different types of nerve endings that distinguish between different temperatures, different types of mechanical contact such as vibrations from a cell phone and movement of hairs, and, importantly, painful stimuli," said Dr. Rice. "Much to our surprise, the skin we received from England lacked all the nerve endings that we normally associated with skin sensation. So how were these individuals feeling anything?"

The answer appeared to be in the presence of sensory nerve endings on the small blood vessels and sweat glands embedded in the skin. "For many years, my colleagues and I have detected different types of nerve endings on tiny blood vessels and sweat glands, which we assumed were simply regulating blood flow and sweating. We didn't think they could contribute to conscious sensation. However, while all the other sensory endings were missing in this unusual [skin](#), the [blood vessels](#) and sweat glands still had the normal types of nerve endings. Apparently, these unique individuals are able to 'feel things' through these remaining nerve endings," said Dr. Rice. "What we learned from these unusual individuals is that there's another level of sensory feedback that can give us conscious tactile information. Problems with these nerve endings may contribute to mysterious pain conditions such as migraine headaches and fibromyalgia, the sources of which are still unknown, making them very difficult to treat."

More information: Bowsher D, Geoffrey Woods C, Nicholas AK, Carvalho OM, Haggett CE, Tedman B, Mackenzie JM, Crooks D, Mahmood N, Aidan Twomey J, Hann S, Jones D, Wymer JP, Albrecht PJ, Argoff CE, Rice FL. Absence of pain with hyperhidrosis: A new syndrome where vascular afferents may mediate cutaneous sensation. *PAIN*. 2009 Dec 15;147(1-3):287-98.

<http://www.painjournalonline.com/article/S0304-3959%2809%2900526-0/abstract>

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